Obesity and Cancer

Scientists have identified a number of factors that increase a person's chance of developing cancer. For example, they have found that cancer is related to the use of tobacco; what people eat and drink; exposure to ultraviolet radiation from the sun; and exposure to cancer-causing agents (carcinogens) in the environment and the workplace.

One factor under investigation is obesity. Obesity is different from overweight. People who are *overweight* have excess body weight, which can come from fat, muscle, bone, and/or water retention. People who are *obese* have an abnormally high, unhealthy proportion of body fat.

More than 50 percent of American adults are overweight to some extent, and almost 25 percent are obese. The number of people who are obese has increased steadily over the past 30 years. From 1960 to 1994, the prevalence of obesity among adults increased from 13.4 percent to 22.3 percent. From 1991 to 1998, obesity increased in every state of the United States, in both sexes, among smokers and nonsmokers, and across race/ethnicity, age, and educational levels. Because of this dramatic rise, even a small increase in cancer risk due to obesity is cause for concern.

Researchers have found a consistent relationship between obesity and a number of diseases, including diabetes, heart disease, high blood pressure, and stroke. Although study results related to cancer have been conflicting, with some showing an increased risk and others not showing such an association, obesity does appear to be linked to some types of cancer. Obesity appears to increase the risk of cancers of the breast, colon, prostate, endometrium (lining of the uterus), cervix, ovary, kidney, and gallbladder. Studies have also found an increased risk for cancers of the liver, pancreas, rectum, and esophagus. Although there are many theories about how obesity increases cancer risk, the exact mechanisms are not known. They may be different for different types of cancer. Also, because obesity develops through a complex interaction of heredity and lifestyle factors, researchers may not be able to tell whether the obesity or something else led to the development of cancer.

Measurement of Overweight and Obesity

Definitions and measurements of overweight and obesity have varied over time, from study to study, and from one part of the world to another. The variety of ways of determining overweight and obesity affected the results of earlier studies and made it difficult to compare data across studies. Most researchers currently use a formula based on weight and height, known as Body Mass Index (BMI), to study obesity as a risk factor for cancer. A BMI calculator is available at http://www.nhlbisupport.com/bmi on the Internet.

Two components of the National Institutes of Health—the National Heart, Lung, and Blood Institute (NHLBI) and the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK)—convened a panel of experts to provide guidelines for the measurement of overweight and obesity. The report, which was released in June 1998, provided standard

definitions for overweight and obesity that are consistent with the recommendations of many other countries and the World Health Organization. The panel identified overweight as a BMI of 25 to 30, and obesity as a BMI of 30 or more. Health risks increase gradually with increasing BMI. BMI is useful in tracking trends in the population because it provides a more accurate measure of overweight and obesity than weight alone. By itself, however, this measurement cannot give direct or specific information about a person's health.

Recent Research Findings

A study published in the January 2001 issue of *Cancer Causes and Control* evaluated the relationship between obesity and cancer risk. More than 28,000 Swedish patients who were diagnosed as obese were followed for up to 29 years. The researchers compared the incidence of cancer in these patients with the incidence in the general Swedish population. They found 33 percent more cases of cancer among the obese people than in the general population (25 percent more among men and 37 percent more among women). The obese patients had an increased risk for Hodgkin's disease (among men) and cancers of the endometrium, kidney, gallbladder, colon, pancreas, bladder, cervix, ovary, and brain. An association between obesity and liver cancer was also found, but that may be explained by the presence of diabetes and alcoholism in these patients. The researchers also found some associations between obesity and cancer that were not found by previous researchers, including non-Hodgkin's lymphoma (among women) and cancers of the small intestine and larynx. They recommended further study of the association between obesity and these types of cancer.

In another study, published in the November 2, 2000, issue of *The New England Journal of Medicine,* researchers examined the health records of 363,992 Swedish men who had at least

one physical exam between 1971 and 1992, and were followed until their death or the end of 1995. Compared with men in the lowest range for BMI, men in the middle range had a 30- to 60-percent greater risk of renal cell cancer (the most common type of kidney cancer), and men in the highest range had nearly double the risk. There was also a direct association between higher blood pressure and a higher risk of renal cell cancer. A reduction in blood pressure appeared to lower the risk of renal cell cancer.

Obesity may also play a role in a type of esophageal cancer called adenocarcinoma. A study sponsored by the National Cancer Institute concluded that excess abdominal fat may lead to reflux disease (a condition in which liquid from the stomach backs up into the esophagus) by increasing pressure on the stomach. Reflux disease can cause inflammation of tissues at the bottom of the esophagus and can lead to a precancerous condition called Barrett's esophagus, which may develop into cancer of the esophagus. The researchers noted that, although obesity may contribute to reflux disease, it is unclear exactly how obesity increases the risk of esophageal cancer. The research team is also studying dietary factors, but analyses have not been completed.

Research Needs

More research is needed to better understand the effect of obesity on the development of cancer. In particular, studies are needed to evaluate the combined effects of diet, body weight, and physical activity. For some types of cancer, such as colon and breast, it is not clear whether the increased cancer risk is due to extra weight, inadequate consumption of fruits and vegetables, or a high-fat, high-calorie diet. Lack of physical activity also contributes to obesity and appears

to be associated with increased risk of cancers of the breast and colon. Physical inactivity may also be associated with other types of cancer, such as prostate cancer.

However, because physical activity level is difficult to measure, its impact on cancer may be underestimated due to misclassification. In the future, researchers may measure physical fitness, rather than level of physical activity. Physical fitness appears to predict heart disease better than measures of physical activity; the same may be true for cancer. The complex relationship between physical activity and obesity makes it important that researchers include both factors in future epidemiological investigations.

IARC Recommendations

In February 2001, a panel of experts met at the International Agency for Research on Cancer (IARC) in Lyon, France, and concluded that overweight and a sedentary lifestyle are associated with several diseases, including cancer. The panel recommended that prevention of obesity begin early in life, based on healthy eating habits and regular physical activity. The panel advised people who are overweight or obese to avoid gaining additional weight, and to lose weight through dietary changes and exercise. The IARC, which is part of the World Health Organization, coordinates and conducts research on the causes of cancer and develops scientific strategies for cancer control. The full report will be published later in 2001.

Resources

The following U.S. Government agencies have information about controlling weight and preventing overweight and obesity:

Organization:	**National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK)** **Weight-control Information Network (WIN)**
Address:	One Win Way Bethesda, MD 20892–3665
Telephone:	202–828–1025 1–877–946–4627
Fax:	202–828–1028
E-mail:	win@info.niddk.nih.gov
Internet Web site:	http://www.niddk.nih.gov/health/nutrit/win.htm

WIN is a national public information service of the NIDDK. WIN assembles and distributes information and publications about weight control, obesity, and nutritional disorders.

Organization:	**National Heart, Lung, and Blood Institute (NHLBI)** **Obesity Education Initiative**
Address:	Post Office Box 30105 Bethesda, MD 20824–0105
Telephone:	301–592–8573
Fax:	301–592–8563
Internet Web site:	http://www.nhlbi.nih.gov

The NHLBI's Obesity Education Initiative seeks to reduce the risk of heart disease and overall morbidity and mortality from heart disease by reducing the prevalence of overweight and physical inactivity. The NHLBI Web site has information for health professionals as well as patients and the general public.

References

Blot WJ, McLaughlin JK. The changing epidemiology of esophageal cancer. *Seminars in Oncology*. 1999; 26(5 Suppl 15):2–8.

Chow W, Devesa SS, Warren JL; Fraumeni JF. Rising incidence of renal cell cancer in the United States. *Journal of the American Medical Association*. 1999; 281(17):1628–1631.

Chow W, Gridley G, Fraumeni JF, Jarvholm B. Obesity, hypertension, and the risk of kidney cancer in men. *The New England Journal of Medicine*. 2000; 343(18):1305–1311.

Devesa SS, Blot WJ, Fraumeni JF. Changing patterns in the incidence of esophageal and gastric carcinoma in the United States. *Cancer*. 1998; 83(10):2049–2053.

Giacosa A, Franceschi S, La Vecchia C, Favero A, Andreatta R. Energy intake, overweight, physical exercise, and colorectal cancer risk. *European Journal of Cancer Prevention*. 1999; 8 Suppl 1:S53–S60.

Hill HA, Austin H. Nutrition and endometrial cancer. *Cancer Causes and Control*. 1996; 7(1):19–32.

Khaodhiar L, McCowen KC, Blackburn GL. Obesity and its comorbid conditions. *Clinical Cornerstone*. 1999; 2(3):17–31.

McCann J. Obesity, cancer links prompt new recommendations. *Journal of the National Cancer Institute*. 2001; 93(12):901–902.

McLaughlin JK, Lipworth L. Epidemiologic aspects of renal cell cancer. *Seminars in Oncology*. 2000; 27(2):115–123.

McTiernan A, Ulrich C, Slate S, Potter J. Physical activity and cancer etiology: associations and mechanisms. *Cancer Causes and Control*. 1998; 9(5):487–509.

National Institute of Diabetes and Digestive and Kidney Diseases. Overweight, obesity, and health risk. National Task Force on the Prevention and Treatment of Obesity. *Archives of Internal Medicine*. 2000:160(7):898–904.

Rao GN. Influence of diet on tumors of hormonal tissues. *Progress in Clinical and Biological Research*. 394:41–56.

Shepard RJ, Shek PN. Associations between physical activity and susceptibility to cancer: possible mechanisms. *Sports Medicine*. 1998; 26(5):293–315.

Shike M. Body weight and colon cancer. *The American Journal of Clinical Nutrition*. 1996 63(3 Suppl):442S–444S.

Silverman DT, Swanson CA, Gridley G, et al. Dietary and nutritional factors and pancreatic cancer: a case-control study based on direct interviews. *Journal of the National Cancer Institute*. 1998; 90(22):1710–1719.

Steinmetz KA, Potter JD. Vegetables, fruit, and cancer prevention: a review. *Journal of the American Dietetic Association*. 1996; 96(10):1027–1039.

Tominaga S. Major avoidable risk factors of cancer. *Cancer Letters*. 1999:143 Suppl 1: S19–S23.

Wideroff L, Gridley G, Mellemkjaer L, et al. Cancer incidence in a population-based cohort of patients hospitalized with diabetes mellitus in Denmark. *Journal of the National Cancer Institute*. 1997; 89(18):1360–1365.

Wolk A, Gridley G, Svensson M, et al. A prospective study of obesity and cancer risk (Sweden). *Cancer Causes and Control*. 2001; 12(1):13–21.

# # #

Sources of National Cancer Institute Information

Cancer Information Service

Toll-free: 1–800–4–CANCER (1–800–422–6237)
TTY (for deaf and hard of hearing callers): 1–800–332–8615

NCI Online

Internet

Use http://cancer.gov to reach NCI's Web site.

CancerMail Service

To obtain a contents list, send e-mail to cancermail@cips.nci.nih.gov with the word "help" in the body of the message.

CancerFax® fax on demand service

Dial 1–800–624–2511 or 301–402–5874 and follow the voice-prompt instructions.

This fact sheet was reviewed on 9/24/01